

ORIGINAL ARTICLE

The epidemiology of assault across the West Midlands

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Objectives: The purpose of this study is to look at accident and emergency (A&E) attendances and admissions after assault in the West Midlands NHS region across a wide range of acute units.

Methods: This study used data from two sources, the A&E Minimum Data Set and the Hospital Episode Statistics database. Analyses were based on data from 12 of the 21 acute trusts in the West Midlands NHS region for the period 1 April 1999 to 31 March 2000.

Results: Analyses were performed on 15 969 A&E attendances and 1596 admissions. Some 67.4% of attenders and 84.2% of those admitted were male. The mean age of the patients was between 27 and 29 years. Attendance peaked between 2100 and 0259, especially on Friday and Saturday night. The most common injury was to the head. Some 75.3% of A&E attenders were discharged home. The average stay in hospital was two days and six deaths were recorded. Those living in the most deprived areas were nearly four times more likely to be admitted than those in the least deprived areas (175.9 per 1000 compared with 45.1 per 1000).

Conclusions: This study shows assault is predominately a male phenomenon, worst in the evenings and at weekends, and is positively related to deprivation. It is probable that the levels recorded will be an underestimate, however with some additions to the information collected hospital records could create the basis for a comprehensive surveillance system.

Violence is now firmly on the public health agenda in Britain, largely because of increases in injury and homicide rates, particularly among men, and an increase in domestic violence.¹ In the period from April 1999 to March 2000, there were over 579 000 cases of violence against the person recorded by the police nationally. The consequences of violence: fatal and non-fatal injury and psychological harm are left to health professionals to treat, with only a proportion of violence related incidents being reported to the police.²

A clear example of the discrepancy between reported and actual violence is that over the period between 1975 and 1990, police data showed a ninefold increase in violence, whereas A&E data suggested a sixfold increase. Although only a quarter of A&E assault patients seem to be recorded by the police, the steadily increasing volume of "violence against the person" recorded by the police during this time reflect a greater public awareness (*willingness to report*) and recognition of violence as being unlawful.³

The 2000 British Crime Survey estimates that there were 3 246 000 violent offences against adults in 1999.⁴ These can be broken down into mugging 12.5%, wounding 17.5%, and common assault 70%, with men aged 16–24 most at risk. The number of violent offences recorded by the survey has fallen 20% since 1995, while most other sources indicate an increase in violence. Preliminary reports from the 2001 British Crime Survey suggest that violent crime has reduced slightly but still accounts for over 20% of all crimes recorded by the survey.

The UK government have recognised the important part that the health service can play in tackling violence with the 1998 Crime and Disorder Act, which established partnerships to work to reduce crime in localities.⁵ Those involved include the police, local authorities, the probation service, health authorities, the voluntary sector, and local residents and businesses. The purpose is to tackle crime and disorder and help create safer communities. The National Health Service has a key role in any crime and disorder reduction strategy, because it is a universal service that reaches all sectors of the population. This allows the health service to be involved in the detection of some forms of crime (such as domestic violence) and consequently the prevention of repeat offending, as well as in

behaviour modification strategies, particularly for young people.⁶ A key function of these partnerships is to create a comprehensive surveillance system to record violent incidents, and healthcare records provide an opportunity to more reliably estimate the numbers, patterns, and outcomes of assault.

Previously studies have looked at assault patients attending accident and emergency (A&E) and different aspects of their attendance, such as the injuries sustained^{7–8} and others have concentrated on female assault patients.^{9–11} However, most of these studies have been based on attendances or admissions in one A&E department and hence may not be generalisable to other areas. The purpose of this study is to examine A&E attendances and admissions after assault in the West Midlands NHS region across a wide range of units.

METHODS

The study uses data from two sources, the A&E minimum dataset (MDS), and the Hospital Episode Statistics (HES) database. The A&E MDS is collected in computerised A&E departments and contains information on every A&E attendance. The HES database is a construct of data collected locally by the NHS via the Patient Administration System (PAS). The dataset contains details of all admissions to all NHS hospitals.

The analyses are based on data from 12 of the 21 acute trusts in the West Midlands NHS region, for the period 1 April 1999 to 31 March 2000. These trusts collect the MDS and made the data available for analysis. The trusts varied in size and were from both rural and urban areas. Data were extracted from the A&E MDS where assault was specified in the Patient Group field and from the HES database where assault was specified in any of the Diagnosis fields (International Classification of Diseases (ICD) 10 code X85–Y09).

The study covers a population of 3 million people, calculated using health authority and primary care trust population estimates for the areas surrounding the 12 participating A&E departments. Rates per 1000 population were calculated using direct standardisation.

Table 1 Demographic profiles of the data used

Age group	Attendances		Admissions	
	Male	Female	Male	Female
0–4	31	16	7	10
5–14	791	296	64	27
15–24	4935	1548	504	73
25–44	4588	2055	620	96
45–64	1045	450	136	30
65–74	60	51	7	2
75+	41	62	6	14
Total	11491	4478	1344	252

The records do not include those that die outside of hospital or die of complications after discharge. The data do not distinguish between victims and injured perpetrators and relies on the medical staff to record the cause of the injury as an assault.

Links with deprivation were investigated using the Townsend Index¹² as a measure of deprivation. Each patient was assigned into a Townsend quintile based on postcode of residence, and this was used to calculate a quintile specific age/sex standardised assault admission rate.

RESULTS

There were a total of 17 055 attendances at A&E after assault recorded during the study period (1 April 1999 to 31 March 2000). This represents 1.9% of 887 289 A&E attendances. This ranged from between 369 and 2965 attendances at each hospital. A total of 1086 (6.4%) of the A&E records were missing one or more of the necessary fields, therefore analyses were carried out on 15 969 records.

There were 1618 admissions after assault recorded during the study period, out of a total of 1.2 million records in the HES database. The numbers of assault patients being admitted ranged from 44 to 341 across the hospitals. Twenty two (1.4%) records were incomplete therefore analyses were carried out on 1596 records.

Demography

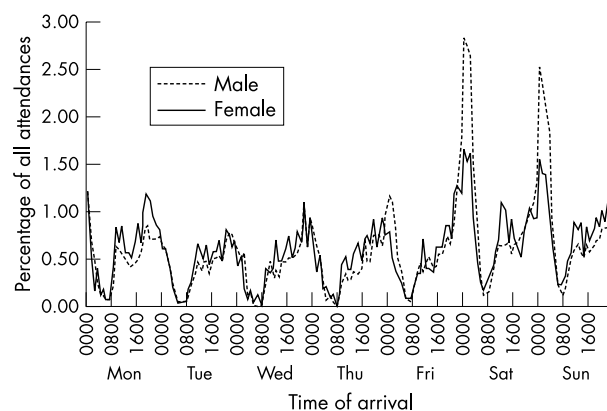
Table 1 shows the demographic profiles of the two datasets. Male attendances at A&E peaked between 15 and 24 years (43.0% of male attendances), whereas female attendances peaked in the 24–44 age group (45.9% of female attendances). Admissions peaked in the 25–44 age group (46.1% of men and 38.1% of women). The number of male patients is higher than female patients in all groups except the over 75 year olds.

The overall A&E attendance rate was 5.1 per 1000 (7.2 for men and 2.8 for women). It was highest in male patients aged 15–19 and 20–24 (20.1 and 15.0 per 1000 respectively). The admission rate was 0.5 per 1000 (0.9 for males and 0.2 for females). Again it was highest in male patients aged 15–19 and 20–24 (2.3 and 2.2 per 1000 respectively).

Some 67.4% of A&E attenders and 84.2% of those admitted were male. The mean age of the attenders was 27 and 29 years for men and women respectively, and for those admitted it was 28 and 29 years.

Temporal trends

Figure 1 shows attendances by hour and by day for both sexes. Throughout the week attendance peaked during the evening and early hours of the morning. The largest peaks were on Friday and Saturday night (11.3% and 9.6% of all attendances were between 2100 and 0259). These peaks were more pronounced for male attendees than female attendees.

**Figure 1** A&E attendance by hour and day.

Overall male attendances were highest between 2300 and 0259 whereas female attendances were highest between 2100 and 0059. Peak attendance was between 0000 and 0059 for those aged between 15 and 64 years. In those aged under 15 the proportion of attendances was higher in the early evening (1700–2159). Attendances were more evenly distributed throughout the day in those over 65 years, with the highest proportion of attendances between 1800 and 1959.

When looking at attendance by day those between 15 and 74 attended most frequently at the weekend, while those aged under 15 attended more frequently between Monday and Friday. The main difference between the sexes was that the proportion of female attendances was slightly higher than that in males between Monday and Thursday, with the proportion of male attendances being higher on Fridays, Saturdays, and Sundays. The pattern of admissions followed that of attendances, with a higher percentage occurring at the weekend (46.2% of males and 39.7% of females). Most male patients were admitted on a Saturday (25.1%) and most women were admitted on a Sunday (22.2%).

The highest number of A&E attendances occurred on New Year's day, with 134 patients visiting A&E after an assault. The lowest number of attendances in one day was 13 (Tuesday 21 December) and the median was 40 attendances.

Arrival mode

The mode of transport used to get to A&E is coded as being by ambulance or by any other means of transport. Table 2 shows the percentage in each age group arriving by either method; 30.2% of patients arrived by ambulance. This was highest in the over 75 age group (70.1%) and lowest in the 5–14 age group (12.3%). Ambulance use was mainly throughout the evening and night, with 82.2% of all ambulance arrivals occurring between 1800 and 0559. 61.0% of "other" arrivals occurred during this time period. Some 13.6% of patients arriving by ambulance were admitted compared with only 4.5% of those arriving by other means of transport.

Table 2 Ambulance use by age

Age band	Ambulance	Other
0–4	28.6	71.4
5–14	12.3	87.7
15–24	27.2	72.8
25–44	32.1	67.9
45–64	42.9	57.1
65–74	50.6	49.4
75+	70.1	29.9
All ages	30.2	69.8

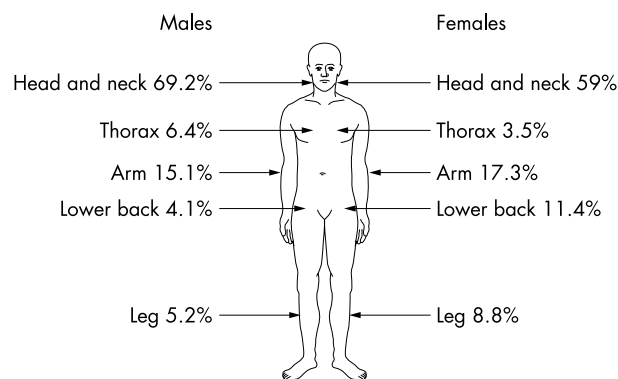


Figure 2 Injuries sustained by sex and body region.

Injuries sustained

Analysis of the diagnosis information from two A&E departments, where ICD10 is used, revealed that the most common reason for visiting A&E was head injury. Injuries to the head and face, such as a wound to the lip, scalp, or eye area were among the 10 most common diagnoses in both departments, as were injuries to the thorax and the hand.

Figure 2 shows the injuries sustained by body region in patients that were admitted.

Head and neck injuries accounted for the largest proportion of admissions (69.2% of males and 59.0% of females).

Disposal from A&E

Some 75.3% of A&E attenders were discharged home with no further treatment. This varied across age groups, with most 5–14 year olds (84.4%) and least over 75 year olds (66.3%) being discharged. Some 7.1% of all attenders were admitted or transferred to a hospital ward. This was highest for the 0–4 and over 75 years olds (15.9% and 17.8% respectively). When looking at sex differences, a higher proportion of male patients were admitted than female patients (8.2% compared with 4.3%).

Thirteen per cent of patients were referred to an out-patient's clinic, and 3.1% received no treatment in the department either because they refused it or they left before seeing a doctor.

Outcome

The average length of stay in hospital was 1.9 days for males and 2.4 days for females (see table 3). However, this varied greatly across different age groups, with the length of stay being greater at both ends of the age spectrum. There were three deaths recorded in the A&E data, all of whom were male. Of those admitted three died (one male and two female).

Deprivation

There was a positive relation between deprivation, as measured by Townsend quintile, and the incidence of assault

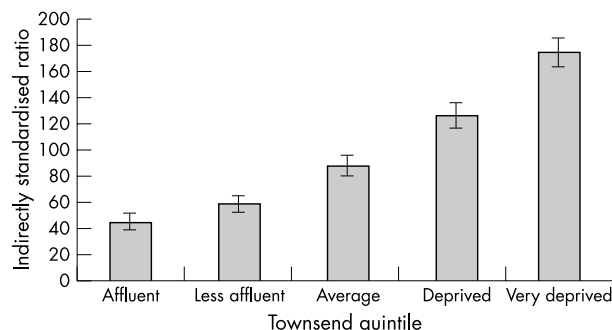


Figure 3 Incidence of assault by Townsend quintile.

(see fig 3). The age/sex standardised assault admission ratio increased from 45.1 per 1000 (95% confidence intervals 39.5 to 51.3) in the least deprived quintile to 175.9 per 1000 (165.9 to 187.4) in the most deprived.

DISCUSSION

Assault accounted for 1.9% of all attendances at A&E, however this is probably only the tip of the iceberg. According to the British Crime Survey 2000, 4.2% of adults in England and Wales were the victims of violent crime in 1999, but of these only 14% sought medical attention from a doctor.⁴ This equates to a rate of 5.9 per 1000 (7.4 for males and 4.6 for females), which compares well to the overall rate of 5.1 per 1000 found in this study and 7.4 per 1000 for males. However, the study rate of 2.8 per 1000 for females attending A&E is much lower than the British Crime Survey estimate and may represent a reluctance of women to seek medical attention or to admit to the cause of their injury, or a greater prevalence of minor injuries.

The highest rates were found in males aged 15–19 and 20–24 (23.7 and 20.1), which reflect findings elsewhere.⁴ In fact, males accounted for 67% of A&E attendances and 84% of admissions in this study. There was little difference in the age profiles, with mean ages for A&E attenders of 27 and 29 years for males and females respectively.

It has been reported that alcohol consumption is related to assault, with 60%–70% of those suffering physical violence having been found to have a positive blood alcohol level at the time of the attack.¹³ Alcohol licensing laws mean that most bars and pubs have to be vacated by 2330, and clubs by 0200, therefore most alcohol related incidents occur around these times. Results from this study followed this pattern with 52.2% of attendances occurring between 2000 and 0359. However, most hospitals do not collect blood alcohol measurements and it is not routinely recorded in their data, therefore this study cannot add to these findings or look at alcohol as a risk factor for assault.

There were some differences between males and females in the day of admission. Most male patients were admitted on a Saturday whereas more females were admitted on a Sunday (22.2%). There are no data available to investigate the reasons for this, but it could be attributable to some delay in presenting or be specific to certain types of assault.

Altogether 3805 patients arrived at A&E by ambulance (30.2% of all attendances), with over 80% of these occurring between 1800 and 0559. Further information is needed to know whether the incidents occurring during this time were more serious than those occurring at other times of the day. There was a general trend of an increase in ambulance use with increasing age. Over 70% of the over 75s arrived at A&E by ambulance. This use is likely to be appropriate as the over 75s had the highest admission rate.

The injuries sustained are not unexpected, being predominantly to the head for both attenders and those admitted.^{11 14}

Table 3 Length of stay in hospital by age

Age band	Male	Female
0–4	4.9	2.2
5–14	1.2	0.8
15–24	1.5	1.6
25–44	1.9	1.4
45–64	3.5	4.5
65–74	4.0	19.5
75+	16.5	11.6
All ages	1.9	2.4

The higher percentage of head and neck injuries in males may account for the increased admission rate in males. Injuries to the upper limbs were the second most common reason for being admitted and were included in the 10 most common diagnoses in A&E attenders. The large number of upper limb injuries may reflect a tendency on the part of the victim to defend themselves by using their arms, or the result of the assailant or defendant striking the other person.¹⁵

In general the physical outcomes for assault patients are good. Some 75.3% of assault attenders in this study were discharged home, and there were only six deaths recorded across the two datasets. For those admitted the average length of stay was greatest in those aged over 75 in males and over 65 in females. Older people are also more likely to have other conditions that may complicate and lengthen their hospital stay. This study found fewer patients being admitted than in other studies. Makower *et al* found 12% were admitted, and Shepherd *et al* found that 16% of males and 18% of females were admitted.⁷⁻¹¹ However, these studies were much smaller and based in single A&E departments, which may have allowed them to achieve a higher level of case ascertainment. This study shows that 8.2% of males and 4.3% of females were admitted to a hospital bed, suggesting that the injuries sustained by males are more severe than those by females. There was a large variation in the proportion of patients admitted in different age groups, with admissions being lowest in the 5–14 year old age group (3.9%) and highest in the over 75s (17.8%).

The number of patients admitted from A&E does not match the numbers recorded in HES due in part to different information systems in A&E and the rest of the hospital, and the possibility that patients give differing information at different times. It also depends upon the judgment of the doctor as to whether they record it as an assault. A patient may not be prepared to admit they have been involved in an assault, either through fear of reprisal or of police involvement. The assault literature focuses mainly on adults therefore it is unclear whether the numbers in the 0–4 age group are a true reflection of the incidence of assault in children. There is also the possibility of data being recorded inaccurately as there is no mandatory quality control when inputting data. Therefore it is likely that the levels recorded in routinely collected data will be an underestimate.

Socioeconomic factors seem to play a part in predicting the likelihood of being injured in an assault. It was found that those living in the most deprived quintile were nearly four times more likely to be admitted after an assault than those living in the least deprived quintile. Similar results have been found by Howe and Crilly.¹⁶ A weakness of using routinely collected data is that they are based on residence, not incident location. Therefore it is not possible to look at assault rates according to where assaults occur, or whether people are assaulted in the area in which they live.

There are several ways in which this work could be expanded to produce more detailed information on assault. One of these is the inclusion of police data. This would identify the proportion of assaults that are not reported to the police, and could provide information about the attacker, the incident location, and the type of attack. Another is the use of ambulance data, which can provide information such as conscious level, Glasgow coma score, and blood loss. Record linkage techniques could be used to follow up patients from the ambulance into A&E, and from A&E into hospital if admitted. These datasets allow for longitudinal study and therefore trend analysis.

The methods described here permit an opportunistic insight into the issue of assault. There are gaps in our knowledge, however this is a cheap and replicable methodology that

can be used in most health regions. With more diligence in the data collection process the A&E MDS and HES databases could contain useful and good quality information to study every aspect of the patient pathway. These databases could be improved to collect more specific information about the assault incident, in particular the location and the influence of alcohol, and create the basis for a comprehensive surveillance system, which can then be used for prevention purposes.

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Contributors

Richard Wilson was responsible for initiating and coordinating the study. All authors were involved in the design of the study. Amy Downing collected, processed, and analysed the A&E data. Sarafina Cotterill undertook the analyses involving HES data. Richard Wilson and Amy Downing jointly wrote the paper. Sarafina Cotterill made comments on drafts of the paper.

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